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STRAUB & POKOTYLO 620 TINTON AVENUE BLDG. B, 2ND FLOOR TINTON FALLS, NJ 07724			TORRES, JUAN A	
			ART UNIT	PAPER NUMBER
			2631	

DATE MAILED: 01/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/943,811

Applicant(s)

LAROIA, RAJIV

Examiner

Juan A. Torres

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 August 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-59 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 27-39 is/are allowed.
- 6) ☒ Claim(s) 1-6,10,12,13,15,17-20,23-25,40-46,48-57 and 59 is/are rejected.
- 7) ☒ Claim(s) 7-9,11,14,16,21,22,26,47 and 58 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION***Drawings***

The drawings are objected to because: the recitation in Figure 1 block 3 described as "Fourier Transform Operator" is indefinite, it is suggested to be changed to "Inverse Fourier Transform Operator". Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

The disclosure is objected to because of the following informalities:

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In page 2 in the third paragraph beginning with " Fig.1" lines 8 and 9 the recitation "by a Fourier transform operator 3, e.g., a discrete or fast Fourier transform circuit" is erroneous it is suggested to be changed to "by an Inverse Fourier Transform operator 3, e.g., an inverse discrete or Inverse Fast Fourier Transform circuit (IFFT)".

Appropriate correction is required.

Claim Objections

Claim 2 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. The case M=N is already included in claim 1.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 56 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The specification doesn't disclose the means for (112 6th paragraph) generating a multi-part prefix including a first cyclic prefix portion and a second signal continuity portion.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this

Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 18-20, 41-46 and 48-50 rejected under 35 U.S.C. 102(b) as being anticipated by Cimini (US 6005876).

As per claim 18 Cimini discloses a multi-tone signal communications method for communicating information using at least NxM tones, where NxM is a positive integer greater than one, the method comprising (Figure 3 column 3 lines 14-20): separately generating, for each one of the NxM tones, a passband periodic signal representing a symbol (Figure 3 column 3 lines 18-19); and transmitting the NxM generated passband periodic signals (Figure 3 column 4 lines 53-55).

As per claim 19 Cimini discloses that the passband periodic signals for each one of the NxM tones are generated in parallel (Figure 3 column 4 lines 53-55); and wherein the step of transmitting the NxM generated passband periodic signals includes broadcasting different ones of said NxM passband periodic signals using different antennas (M) (Figure 3 column 3 lines 14-21).

As per claim 20 Cimini discloses the combination of N generated passband periodic signals prior to transmission (Figure 3 column 3 lines 14-15).

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As per claim 41 Cimini discloses a method of sequentially transmitting symbols in a multi-tone signal communication system using N tones per symbol period, wherein the N tones remain the same for multiple symbol periods, the time period in which the N tones remain the same (figure 3 column 3 lines 11-14) being a dwell, the method comprising; transmitting N signals corresponding to each one of the N tones of the multi-tone signal, each one of the N signals being transmitted on a corresponding one of a first plurality of antennas, the antenna being used to transmit signals corresponding to a particular tone during the dwell remaining the same throughout the dwell (figure 3 column 3 lines 14-24).

As per claim 42 Cimini discloses that for each symbol transmission period of a second time transmitting N signals corresponding to each one of the N tones of the multi-tone signal, each one of the N signals being transmitted on a corresponding one of a second plurality of antennas, the antenna being used to transmit signals corresponding to a particular tone during the second dwell remaining the same throughout the second dwell, the second plurality of antennas including at least one antenna which is different from the antennas included the first plurality of antennas (figure 3 column 5 lines 9-27 and 31-34).

As per claim 43 Cimini discloses that for each of a plurality of symbol transmission periods rotating the constellation of symbols from which consecutive symbols are transmitted using one of said N tones by a fixed amount (figure 3 column 5 lines 13-14); and selecting a symbol to be transmitted from a constellation of symbols to be transmitted using a signal corresponding to one of N tones (figure 3 column 5 lines 15-27).

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As per claim 44 Cimini discloses that the rotation of the constellation during each of the plurality of symbol transmission period has a cumulative rotational effect on the constellation from which symbols are selected causing the rotation of the symbols in one symbol transmission period to effect the constellation from which symbols are selected during the next symbol transmission period (figure 3 column 5 lines 15-27, lines 28-31).

As per claim 45 Cimini discloses that the rotation of the constellation during each of the plurality of symbol transmission periods is by a fixed additive amount which does not effect the position of the symbols in the constellation from which the next symbol is selected (figure 3 column 5 lines 15-27, lines 28-31).

As per claim 46 Cimini discloses that amount by which the constellation of symbols is rotated is a function of the tone frequency (figure 3 column 5 lines 14-20).

As per claim 48 Cimini discloses a transmitter for broadcasting a signal corresponding a multi-tone signal, the transmitter comprising M periodic signal generators for generating periodic passband signals representing symbols, where M is a positive integer greater than 1, each one of the M periodic signal generators generating a periodic signal having a frequency corresponding to a different one of N tones of said multi-tone signal (figure 3 column 3 lines 14-20 and column 4 lines 53-55); and a plurality of M antennas, each one of the M antennas being coupled to at least one of the periodic signal generators, each periodic signal generator being coupled to a single one of said M antennas (figure 3 column 3 lines 14-20 and column 4 lines 53-55).

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As per claim 49 Cimini discloses that each one of the periodic signal generators being coupled to a different one of said M antennas (figure 3 column 4 lines 53-55).

As per claim 50 Cimini discloses that the plurality of periodic signal generators are housed in a portable device (figure 3 column 1 lines 5-10) and are powered by a battery (the battery is inherent to the portable device).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cimini (US 6005876).

As per claim 1 Cimini discloses a multi-tone signal communications method for communicating information using NxM tones, where NxM is a positive integer greater than one, the method comprising: generating NxM signals, each one of the NxM signals corresponding to a different one of the NxM tones; and transmitting the NxM signals into a communications channel using M antennas (Figure 3 column 2 lines 25-30), where M is an integer and where $1 < M \leq NxM$ (Figure 3 column 3 lines 15-23). Cimini doesn't disclose that the signals are analog signals. The system disclosed by Cimini can be used to transmit analog signals instead of digital signals. The system disclosed by Cimini transmitting

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analog or digital signals are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify the system using analog signals in the technique disclosed by Cimini. The suggestion/motivation for doing so would have been to reduce the complexity of the system transmitting analog signals because the use of an analog to digital converted is not needed.

As per claim 2 Cimini discloses that the number of tones ($M \times N$) could be the same than the number of antennas (M) ($N=1$) (Figure 3 column 4 lines 53-55). Cimini doesn't disclose that the signals are analog signals. The system disclosed by Cimini can be used to transmit analog signals instead of digital signals. The system disclosed by Cimini transmitting analog or digital signals are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify the system using analog signals in the technique disclosed by Cimini. The suggestion/motivation for doing so would have been to reduce the complexity of the system transmitting analog signals because the use of an analog to digital converted is not needed.

As per claim 3 Cimini discloses amplifying each of the $M \times N$ analog signals prior to transmitting said $M \times N$ analog signals (Figure 3 column 3 lines 18-19). Cimini doesn't disclose that the signals are analog signals. The system disclosed by Cimini can be used to transmit analog signals instead of digital signals. The system disclosed by Cimini transmitting analog or digital signals are analogous art because they are from the same field of endeavor. At the time of the

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invention it would have been obvious to a person of ordinary skill in the art to modify the system using analog signals in the technique disclosed by Cimini.

The suggestion/motivation for doing so would have been to reduce the complexity of the system transmitting analog signals because the use of an analog to digital converted is not needed.

Claims 4, 5, 23-25, 51-55, 57 and 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cimini (US 6005876) as applied to claim 3 above, and further in view of Cimini (US 5914933).

As per claim 4 Cimini (US 6005876) discloses claim 3. Cimini (US 6005876) doesn't disclose the use of prefix signals. Cimini (US 5914933) discloses that the analog signals has a duration corresponding to at least a symbol transmission period and wherein each of the analog signals includes a periodic signal representing a symbol to be transmitted during said symbol transmission period, and separately generating signal prefixes, one signal prefix being generated for each one of the analog signals from the one of the periodic signals included in the corresponding one of the analog signals (Figure 3 column 5 lines 56-62). Cimini (US 6005876) and (US 5914933) teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to integrate the signal prefix technique disclosed by Cimini (US 5914933) in each of the antennas lines disclosed by Cimini (US 6005876). The suggestion/motivation for doing so would have been to reduce the Inter-Symbol Interference.

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As per claim 23 Cimini (US 6005876) discloses claim 18. Cimini (US 6005876) doesn't disclose the generation of a separate prefix for each of the generated passband periodic signals, and combining, prior to transmission, each one of the separate prefixes with the corresponding one of the generated passband periodic signals. Cimini (US 5914933) discloses the generation of a separate prefix for each of the generated passband periodic signals (Figure 3 column 5 lines 56-62); and combining, prior to transmission, each one of the separate prefixes with the corresponding one of the generated passband periodic signals (Figure 3 block 41 column 5 lines 56-62). Cimini (US 6005876) and (US 5914933) teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to integrate the signal prefix technique disclosed by Cimini (US 5914933) in each of the antennas lines disclosed by Cimini (US 6005876). The suggestion/motivation for doing so would have been to reduce the Inter-Symbol Interference.

As per claim 24 Cimini (US 6005876) and (US 5914933) disclose claim 23. Cimini (US 5914933) also discloses that the prefixes for each of the N passband periodic signals are generated in parallel (Figure 3 block 41.... column 5 lines 56-62). Cimini (US 6005876) and (US 5914933) teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to integrate the signal prefix technique disclosed by Cimini (US 5914933) in each of

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the antennas lines disclosed by Cimini (US 6005876). The suggestion/motivation for doing so would have been to reduce the Inter-Symbol Interference.

As per claim 25 Cimini (US 6005876) and (US 5914933) disclose claim 23. Cimini (US 5914933) also discloses the step of combining each one of the separate prefixes with the corresponding one of the N generated passband periodic signals including pre-pending the generated prefix to the corresponding one of the N generated passband periodic signals (Figure 3 block 41.... column 5 lines 56-62). The pre-pending the generated prefix to the corresponding one of the N generated passband periodic signals in inherit to the signal prefix, this can be seeing in the general literature such as in "Introduction to OFDM, II edition: OFDM as a possible modulation technique for multimedia applications in the range of mm waves" 10/30/98 pp. 11-12 (guard interval and its implementation) Dusan Matiae; "ADSL/VDSL Principles" Sr. Dennis Rauschmayer MTP 1999 pp 202 and 225; ITU G.992.1 R(06/99) Recommendation " ADSL transceivers) pp 53. Cimini (US 6005876) and (US 5914933) teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to integrate the signal prefix technique disclosed by Cimini (US 5914933) in each of the antennas lines disclosed by Cimini (US 6005876). The suggestion/motivation for doing so would have been to reduce the Inter-Symbol Interference.

As per claim 51 Cimini (US 6005876) discloses a system for generating and transmitting signals corresponding to an N tone multi-tone signal, where N is a positive integer greater than 1, the system comprising N periodic signal

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generator circuits for generating periodic signals, each periodic signal corresponding to a different tone one of the N tones of the multi-tone signal (Figure 3 column 3 lines 15-23). Cimini (US 6005876) doesn't disclose the use of prefix signals. Cimini (US 5914933) discloses prefix generator circuits for independently generating periodic signal prefixes, each one of the N prefix generator circuits being coupled to a different corresponding one of the N periodic generator circuits (figure 2 block 41 column 5 lines 56-62). Cimini (US 6005876) and (US 5914933) teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to integrate the signal prefix technique disclosed by Cimini (US 5914933) in each of the antennas lines disclosed by Cimini (US 6005876). The suggestion/motivation for doing so would have been to reduce the Inter-Symbol Interference.

As per claim 52 Cimini (US 6005876) and (US 5914933) disclose claim 51. Cimini (US 6005876) also discloses N filters for independently filtering the N periodic signals including prefixes generated by the N prefix generator circuits, each one of the N filters being coupled to a different corresponding one of the N prefix generator circuits (figure 3 column 3 line 18). Cimini (US 6005876) and (US 5914933) teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to integrate the signal prefix technique disclosed by Cimini (US 5914933) in each of the antennas lines disclosed by Cimini (US

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6005876). The suggestion/motivation for doing so would have been to reduce the Inter-Symbol Interference.

As per claim 53 Cimini (US 6005876) and (US 5914933) disclose claim 52. Cimini (US 6005876) also discloses a plurality of M antennas, where M is an integer and where (figure 3 column 3 line 14-20), each of the N filters being coupled to a single one of the M antennas and each one of the M antennas being coupled to at least one of the N filters (figure 3 column 3 line 18). Cimini (US 6005876) and (US 5914933) teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to integrate the signal prefix technique disclosed by Cimini (US 5914933) in each of the antennas lines disclosed by Cimini (US 6005876). The suggestion/motivation for doing so would have been to reduce the Inter-Symbol Interference.

As per claim 54 Cimini (US 6005876) and (US 5914933) disclose claim 53. Cimini (US 6005876) also discloses $M=N$ (figure 3 column 4 line 53-55). Cimini (US 6005876) and (US 5914933) teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to integrate the signal prefix technique disclosed by Cimini (US 5914933) in each of the antennas lines disclosed by Cimini (US 6005876). The suggestion/motivation for doing so would have been to reduce the Inter-Symbol Interference.

As per claim 55 Cimini (US 6005876) and (US 5914933) disclose claim 54. Cimini (US 6005876) also discloses $M < N$, the system further comprising, at

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least one analog combining circuit for combining signals from a subset of said N filters into a signal filter and for coupling each filter in the subset of said N filters one of said M antennas (figure 3 column 4 line 13-19). Cimini (US 6005876) and (US 5914933) teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to integrate the signal prefix technique disclosed by Cimini (US 5914933) in each of the antennas lines disclosed by Cimini (US 6005876). The suggestion/motivation for doing so would have been to reduce the Inter-Symbol Interference.

As per claim 57 Cimini (US 6005876) and (US 5914933) disclose claim 51. Cimini (US 5914933) also discloses each of the N prefix generator circuits generates a separate prefix, each one of the N separate prefixes having the same duration (figure 2 column 5 line 58-62). Cimini (US 6005876) and (US 5914933) teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to integrate the signal prefix technique disclosed by Cimini (US 5914933) in each of the antennas lines disclosed by Cimini (US 6005876). The suggestion/motivation for doing so would have been to reduce the Inter-Symbol Interference.

As per claim 59 Cimini (US 6005876) and (US 5914933) disclose claim 57. Cimini (US 5914933) also discloses that each of the N periodic signal generators includes a sinusoidal generating means, each one of said N periodic signals including a sinusoidal signal having a frequency component

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corresponding to one of said N tones of the multi-tone signal (figure 2 column 5 line 35 equation 1). Cimini (US 6005876) and (US 5914933) teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to integrate the signal prefix technique disclosed by Cimini (US 5914933) in each of the antennas lines disclosed by Cimini (US 6005876). The suggestion/motivation for doing so would have been to reduce the Inter-Symbol Interference.

Claims 4, 5, 23-25, 51-55, and 57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cimini (US 6005876) as applied to claim 3 above, and further in view of Walton (US Patent Application Publication 20020154705).

As per claim 4 Cimini discloses claim 3. Cimini doesn't disclose the use of prefix signals. Walton discloses that the analog signals has a duration corresponding to at least a symbol transmission period and wherein each of the analog signals includes a periodic signal representing a symbol to be transmitted during said symbol transmission period, and separately generating signal prefixes, one signal prefix being generated for each one of the analog signals from the one of the periodic signals included in the corresponding one of the analog signals (Figure 3 page 9 paragraph [0105] and page 12 paragraph [0131]). Cimini and Walton teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to integrate the signal prefix technique disclosed by Walton in each of the antennas lines disclosed by Cimini. The suggestion/motivation for doing so would have been to insure that the

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transmission symbol retains its orthogonal properties in the presence of multipath delay spread, thereby improving performance against deleterious path effects reduce the Inter-Symbol Interference (Walton page 9 paragraph [0105]) and equivalently to reduce the Inter-Symbol Interference.

As per claim 5 Cimini and Walton disclose claim 4. Walton also discloses that the periodic signals and signal prefixes are generated in the passband (Figure 3 block 322 page 9 paragraph [0105]). Cimini and Walton teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to integrate the signal prefix technique disclosed by Walton in each of the antennas lines disclosed by Cimini. The suggestion/motivation for doing so would have been to insure that the transmission symbol retains its orthogonal properties in the presence of multipath delay spread, thereby improving performance against deleterious path effects reduce the Inter-Symbol Interference (Walton page 9 paragraph [0105]) and equivalently to reduce the Inter-Symbol Interference.

As per claim 23 Cimini discloses claim 18. Cimini doesn't specifically disclose the generation of a separate prefix for each of the generated passband periodic signals and combining, prior to transmission, each one of the separate prefixes with the corresponding one of the generated passband periodic signals. Walton discloses the generation of a separate prefix for each of the generated passband periodic signals (Figure 3 block 322 page 9 paragraph [0105]); and combining, prior to transmission, each one of the separate prefixes with the corresponding one of the generated passband periodic signals (Figure 3 block

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322 page 9 paragraph [0105]). Cimini and Walton teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to integrate the signal prefix technique disclosed by Walton in each of the antennas lines disclosed by Cimini. The suggestion/motivation for doing so would have been to insure that the transmission symbol retains its orthogonal properties in the presence of multipath delay spread, thereby improving performance against deleterious path effects reduce the Inter-Symbol Interference (Walton page 9 paragraph [0105]) and equivalently to reduce the Inter-Symbol Interference.

As per claim 24 Cimini and Walton disclose claim 23. Walton also discloses that the prefixes for each of the passband periodic signals are generated in parallel (Figure 3 block 322 page 9 paragraph [0105]). Cimini and Walton teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to integrate the signal prefix technique disclosed by Walton in each of the antennas lines disclosed by Cimini. The suggestion/motivation for doing so would have been to insure that the transmission symbol retains its orthogonal properties in the presence of multipath delay spread, thereby improving performance against deleterious path effects reduce the Inter-Symbol Interference (Walton page 9 paragraph [0105]) and equivalently to reduce the Inter-Symbol Interference.

As per claim 25 Cimini and Walton disclose claim 23. Walton also discloses the step of combining each one of the separate prefixes with the

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corresponding one of the generated passband periodic signals including pre-pending the generated prefix to the corresponding one of the generated passband periodic signals (Figure 3 block 322 page 9 paragraph [0105]). The pre-pending the generated prefix to the corresponding one of the N generated passband periodic signals in inherit to the signal prefix, this can be seeing in the general literature such as in "Introduction to OFDM, II edition: OFDM as a possible modulation technique for multimedia applications in the range of mm waves" 10/30/98 pp. 11-12 (guard interval and its implementation) Dusan Matiae; "ADSL/VDSL Principles" Sr. Dennis Rauschmayer MTP 1999 pp 202 and 225; ITU G.992.1 R(06/99) Recommendation "ADSL transceivers) pp 53. Cimini and Walton teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to integrate the signal prefix technique disclosed by Walton in each of the antennas lines disclosed by Cimini. The suggestion/motivation for doing so would have been to insure that the transmission symbol retains its orthogonal properties in the presence of multipath delay spread, thereby improving performance against deleterious path effects reduce the Inter-Symbol Interference (Walton page 9 paragraph [0105]) and equivalently to reduce the Inter-Symbol Interference.

As per claim 51 Cimini discloses a system for generating and transmitting signals corresponding to an N tone multi-tone signal, where N is a positive integer greater than 1, the system comprising N periodic signal generator circuits for generating periodic signals, each periodic signal corresponding to a different

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tone one of the N tones of the multi-tone signal (Figure 3 column 3 lines 15-23).

Cimini doesn't disclose the use of prefix signals. Walton discloses prefix generator circuits for independently generating periodic signal prefixes, each one of the N prefix generator circuits being coupled to a different corresponding one of the N periodic generator circuits (Figure 3 block 322 page 9 paragraph [0105]). Cimini and Walton teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to integrate the signal prefix technique disclosed by Walton in each of the antennas lines disclosed by Cimini. The suggestion/motivation for doing so would have been to insure that the transmission symbol retains its orthogonal properties in the presence of multipath delay spread, thereby improving performance against deleterious path effects reduce the Inter-Symbol Interference (Walton page 9 paragraph [0105]) and equivalently to reduce the Inter-Symbol Interference.

As per claim 52 Cimini and Walton disclose claim 51. Cimini and Walton also discloses N filters for independently filtering the N periodic signals including prefixes generated by the N prefix generator circuits, each one of the N filters being coupled to a different corresponding one of the N prefix generator circuits (Cimini figure 3 column 3 line 18) (Walton Figure 3 page 10 paragraph [0106]). Cimini and Walton teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to integrate the signal prefix technique disclosed by Walton in each of the antennas lines disclosed by Cimini. The

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suggestion/motivation for doing so would have been to insure that the transmission symbol retains its orthogonal properties in the presence of multipath delay spread, thereby improving performance against deleterious path effects reduce the Inter-Symbol Interference (Walton page 9 paragraph [0105]) and equivalently to reduce the Inter-Symbol Interference.

As per claim 53 Cimini and Walton disclose claim 52. Cimini and Walton also discloses a plurality of M antennas, where M is an integer and where (figure 3 column 3 line 14-20), each of the N filters being coupled to a single one of the M antennas and each one of the M antennas being coupled to at least one of the N filters (Cimini figure 3 column 3 line 18) (Walton figure 3 block 116 page 4 paragraph [0045]). Cimini and Walton teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to integrate the signal prefix technique disclosed by Walton in each of the antennas lines disclosed by Cimini. The suggestion/motivation for doing so would have been to insure that the transmission symbol retains its orthogonal properties in the presence of multipath delay spread, thereby improving performance against deleterious path effects reduce the Inter-Symbol Interference (Walton page 9 paragraph [0105]) and equivalently to reduce the Inter-Symbol Interference.

As per claim 54 Cimini and Walton disclose claim 53. Cimini also discloses the possibility of $M=N$ (figure 3 column 4 line 53-55). Cimini and Walton teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary

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skill in the art to integrate the signal prefix technique disclosed by Walton in each of the antennas lines disclosed by Cimini. The suggestion/motivation for doing so would have been to insure that the transmission symbol retains its orthogonal properties in the presence of multipath delay spread, thereby improving performance against deleterious path effects reduce the Inter-Symbol Interference (Walton page 9 paragraph [0105]) and equivalently to reduce the Inter-Symbol Interference.

As per claim 55 Cimini and Walton disclose claim 54. Cimini (US 6005876) also discloses $M < N$, the system further comprising, at least one analog combining circuit for combining signals from a subset of said N filters into a signal filter and for coupling each filter in the subset of said N filters one of said M antennas (figure 3 column 4 line 13-19). Cimini and Walton teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to integrate the signal prefix technique disclosed by Walton in each of the antennas lines disclosed by Cimini. The suggestion/motivation for doing so would have been to insure that the transmission symbol retains its orthogonal properties in the presence of multipath delay spread, thereby improving performance against deleterious path effects reduce the Inter-Symbol Interference (Walton page 9 paragraph [0105]) and equivalently to reduce the Inter-Symbol Interference.

As per claim 57 Cimini and Walton disclose claim 54. Walton also discloses each of the N prefix generator circuits generates a separate prefix, each one of the N separate prefixes having the same duration (Figure 3 block

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322 page 9 paragraph [0105]). Cimini and Walton teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to integrate the signal prefix technique disclosed by Walton in each of the antennas lines disclosed by Cimini. The suggestion/motivation for doing so would have been to insure that the transmission symbol retains its orthogonal properties in the presence of multipath delay spread, thereby improving performance against deleterious path effects reduce the Inter-Symbol Interference page 9 paragraph [0105]) and equivalently to reduce the Inter-Symbol Interference.

Claims 6 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cimini (US 6005876) and (US 5914933) as applied to claim 4 above, and further in view of Chen (US 6347127).

As per claim 6 Cimini (US 6005876) and (US 5914933) disclose claim 4. Cimini (US 6005876) also disclose that the analog signals has a duration corresponding to multiple symbol transmission periods and wherein said included periodic signal represents a current symbol and wherein each of the N analog signals further includes a periodic signal representing a preceding symbol (Figure 3 column 4 lines 50-53). Cimini (US 6005876) and (US 5914933) don't disclose the use of prefix signals as a function of the periodic signal representing the current symbol and the periodic signal representing the preceding symbol. Chen discloses the generation of the prefix signal as a function of the periodic signal representing the current symbol and the periodic signal representing the preceding symbol (Figure 10 column 2 lines 3-5). Cimini (US 6005876) and (US

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5914933) and Chen teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to combine the technique of generation of the prefix signal as a function of the periodic signal representing the current symbol and the periodic signal representing the preceding symbol disclosed by Chen with the OFDM system disclosed by Cimini (US 6005876). The suggestion/motivation for doing so would have been to insure that the transmission symbol retains its orthogonal properties in the presence of multipath delay spread, thereby improving performance against deleterious path effects reduce the Inter-Symbol Interference and to reduce the Inter-Symbol Interference and to improve the symbol decoding at the receiver (Chen abstract).

As per claim 10 Cimini (US 6005876) and (US 5914933) and Chen teach claim 6. Cimini (US 5914933) also discloses that the periodic signals are a sinusoidal waves (column 5 line 35 equation 1). Cimini (US 6005876) and (US 5914933) and Chen teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to combine the technique of generation of the prefix signal as a function of the periodic signal representing the current symbol and the periodic signal representing the preceding symbol disclosed by Chen with the OFDM system disclosed by Cimini (US 6005876). The suggestion/motivation for doing so would have been to insure that the transmission symbol retains its orthogonal properties in the presence of multipath delay spread, thereby improving performance against deleterious path effects

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reduce the Inter-Symbol Interference and to reduce the Inter-Symbol Interference and to improve the symbol decoding at the receiver (Chen abstract).

Claims 6 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cimini (US 6005876), further in view of Walton (US Patent Application Publication 20020154705) as applied to claim 5 above, and further in view of Chen (US 6347127).

As per claim 6 Cimini and Walton disclose claim 4. Cimini also discloses that the analog signals has a duration corresponding to multiple symbol transmission periods and wherein said included periodic signal represents a current symbol and wherein each of the N analog signals further includes a periodic signal representing a preceding symbol (Figure 3 column 4 lines 50-53). Cimini and Walton don't disclose the use of prefix signals as a function of the periodic signal representing the current symbol and the periodic signal representing the preceding symbol. Chen discloses the generation of the prefix signal as a function of the periodic signal representing the current symbol and the periodic signal representing the preceding symbol (Figure 10 column 2 lines 3-5). Cimini, Walton and Chen teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to combine the technique of generation of the prefix signal as a function of the periodic signal representing the current symbol and the periodic signal representing the preceding symbol disclosed by Chen with the OFDM system disclosed by Cimini and Walton. The suggestion/motivation for doing so would have been to insure that the

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transmission symbol retains its orthogonal properties in the presence of multipath delay spread, thereby improving performance against deleterious path effects reduce the Inter-Symbol Interference and to reduce the Inter-Symbol Interference and to improve the symbol decoding at the receiver (Chen abstract).

As per claim 10 Cimini, Walton and Chen disclose claim 6. Cimini discloses that the periodic signals are sinusoidal waves (column 5 line 35 equation 1). Cimini, Walton and Chen teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to combine the technique of generation of the prefix signal as a function of the periodic signal representing the current symbol and the periodic signal representing the preceding symbol disclosed by Chen with the OFDM system disclosed by Cimini and Walton. The suggestion/motivation for doing so would have been to insure that the transmission symbol retains its orthogonal properties in the presence of multipath delay spread, thereby improving performance against deleterious path effects reduce the Inter-Symbol Interference and to reduce the Inter-Symbol Interference and to improve the symbol decoding at the receiver (Chen abstract).

Claims 12, 13 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cimini (US 6005876), and further in view of Chalmers (US 5668802).

As per claim 12 Cimini disclose a multi-tone signal communications method for communicating information using N tones, where N is a positive integer greater than one, the method comprising: generating in parallel, for each

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one of the N tones, a separate periodic signal (figure 3 column 3 lines 14-23); and transmitting the generated periodic signals into a communications channel (figure 3 column 4 lines 29-34). Cimini doesn't disclose that at least one high order harmonic signal component that is different from the fundamental frequency signal component of the tone. Chalmers discloses that the generated periodic signals include a high order harmonic signal component in addition to a fundamental frequency signal component, the high order harmonic signal component having a frequency which is higher than the frequency of the fundamental signal component (Figure 1 & 2 column 1 lines 51-53). Cimini and Chalmers teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to combine the technique of generated periodic signals include a high order harmonic signal component disclosed by Chalmers with the OFDM system disclosed by Cimini. The suggestion/motivation for doing so would have been to reduce the complexity of the system.

As per claim 13 Cimini and Chalmers disclose claim 12. Chalmers also discloses that includes multiple high order harmonic signal components. Cimini and Chalmers teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to combine the technique of generated periodic signals include a high order harmonic signal component disclosed by Chalmers with the OFDM system disclosed by Cimini. The suggestion/motivation for doing so would have been to reduce the complexity of the system.

As per claim 21 Cimini disclose claim 18. Cimini doesn't disclose that at least some of the generated passband periodic signals include a high order harmonic signal component in addition to a fundamental frequency signal component, the high order harmonic signal component having a frequency which is higher than the frequency of the fundamental signal component. Chalmers discloses that the generated periodic signals include a high order harmonic signal component in addition to a fundamental frequency signal component, the high order harmonic signal component having a frequency which is higher than the frequency of the fundamental signal component (Figure 1 & 2 column 1 lines 51-53). Cimini and Chalmers teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to integrate the technique of generated periodic signals include a high order harmonic signal component in addition to a fundamental frequency signal component, the high order harmonic signal component having a frequency which is higher than the frequency of the fundamental signal component disclosed by Chalmers with the OFDM system disclosed by Cimini. The suggestion/motivation for doing so would have been to reduce the complexity of the system.

Claims 15 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cimini (US 6005876) and Chalmers (US 5668802) as applied to claim 12 above, and further in view of Cimini (US 5914933).

As per claim 15 Cimini (US 6005876) and Chalmers disclose claim 12. Cimini (US 6005876) and Chalmers don't disclose generating, in parallel, for

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each one of the tones, a separate periodic signal prefix. Cimini (US 5914933) discloses generating, in parallel, for each one of the tones, a separate periodic signal prefix (figure 2 block 41 column 5 line 58-62). Cimini (US 6005876) and (US 5914933) and Chalmers teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify the system disclosed by Cimini (US 6005876) and Chalmers with the signal prefix disclosed by Cimini (US 5914933) in each of tones. The suggestion/motivation for doing so would have been to reduce the Inter-Symbol Interference and to improve the symbol decoding at the receiver.

As per claim 17 Cimini (US 6005876) and (US 5914933) and Chalmers disclose claim 15. Cimini (US 5914933) also discloses combining in the passband, the periodic signal corresponding to the one of the tones with the corresponding one of the periodic signal prefixes (figure 2 block 41 column 5 line 58-62 with $M=N$ in Cimini (US 6005876)). Cimini (US 6005876) and (US 5914933) and Chalmers (US 5668802) teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify the system disclosed by Cimini (US 6005876) and Chalmers with the signal prefix disclosed by Cimini (US 5914933) in each of tones. The suggestion/motivation for doing so would have been to reduce the Inter-Symbol Interference and to improve the symbol decoding at the receiver.

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Claims 15 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cimini (US 6005876) and Chalmers (US 5668802) as applied to claim 12 above, and further in view of Walton (US Patent Application Publication 20020154705).

As per claim 15 Cimini and Chalmers disclose claim 12. Cimini and Chalmers don't disclose generating, in parallel, for each one of the tones, a separate periodic signal prefix. Walton discloses generating, in parallel, for each one of the tones, a separate periodic signal prefix (Figure 3 block 322 page 9 paragraph [0105]). Cimini, Chalmers and Walton teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify the system disclosed by Cimini and Chalmers with the signal prefix disclosed by Walton in each of tones. The suggestion/motivation for doing so would have been to reduce the Inter-Symbol Interference and to improve the symbol decoding at the receiver.

As per claim 17 Cimini, Chalmers and Walton disclose claim 15. Walton also discloses combining in the passband, the periodic signal corresponding to the one of the N tones with the corresponding one of the N periodic signal prefixes (Figure 3 block 322 page 9 paragraph [0105]) (figure 2 block 41 column 5 line 58-62 with $M=N$ in Cimini). Cimini, Chalmers and Walton teachings are analogous art because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify the system disclosed by Cimini and Chalmers with the signal prefix

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disclosed by Walton in each of tones. The suggestion/motivation for doing so would have been to reduce the Inter-Symbol Interference and to improve the symbol decoding at the receiver.

Claim 40 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cimini. Cimini discloses a method of broadcasting signals representing tones of an N tone multi-tone signal, for a first period of time corresponding to multiple symbol transmission periods and for a second period of time also corresponding to multiple symbol transmission periods, where N is a positive integer greater than one and the tones in the N tone multi-tone signal are fixed for the first and second periods of time but include different tones in each of the first and second periods of time the method comprising: broadcasting signals corresponding to different tones of the N tone multi-tone signal during the first period of time using a fixed first set of M different antennas where M is an integer and where $M < N$; and broadcasting signals corresponding to different tones of the N tone multi-tone signal during the second period of time using a fixed second set of M different antennas (figure 3 column 5 lines 9-16). Cimini doesn't disclose that at least one antenna in the fixed second set of M different antennas being different from the antennas included in the fixed first set of M different antennas. In the technique disclosed by Cimini, one of the clusters can be set to zero signals (figure 3 column 4 lines 15-16) and in this case the fixed second set of M different antennas will be different from the antennas included in the fixed first set of M different antennas, because in the first time one antenna (i) will be not transmitting and in the second time after the rotation (Cimini column 5 line 14-15)

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this antenna (i) will be used and antenna (i+1) won't. The use of a cluster with zero signals can be incorporated in the system disclosed by Cimini. The suggestion/motivation for doing so would have been to reduce the Inter-Symbol Interference.

Allowable Subject Matter

Claims 27-39 are allowed.

The following is an examiner's statement of reasons for allowance: claims 27-40 are allowed because the references cited fail to teach, as applicant has, a periodic signal processing method, the method comprising: generating a multi-part prefix from a first periodic signal, the step of generating a multi-part prefix from the first periodic signal including: performing a cyclic extension operation on the first periodic signal to generate a cyclic prefix portion, generating a continuity prefix portion, and appending the cyclic prefix portion to the end of the continuity prefix portion, as the applicant has claimed.

Claims 7-8, 9, 11, 14, 16, 21, 22, 26, 47 and 58 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Juan A. Torres whose telephone number is (571) 272-3119. The examiner can normally be reached on Monday-Friday 9:00 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad H. Ghayour can be reached on (571) 272-3021. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JAT 12-2-2004


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